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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/748,698	Applicant(s) MIKKOLA, JYRKI	
	Examiner Jaime M. Holliday	Art Unit 2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 08 June 2007.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-12 is/are pending in the application.

4a) Of the above claim(s) 8 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-7 and 9-12 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Response to Amendment

Response to Arguments

1. Applicant's arguments, with respect to claims 6-7 and the Weber reference, filed June 8, 2007 have been fully considered but they are not persuasive.

Applicant basically argues that Siwiak clearly discloses that the first and second feeders are isolated from the ground plane by apertures 316 and 312, respectively, and disputes the Examiner's contention that Siwiak's first and second feeders, which are conductive elements for feeding signals from an antenna to receiver circuits, could be understood by a person of ordinary skill in the art to be piezoelectric elements. Further Applicant argues that Siwiak discloses a local oscillator and associated circuitry "to provide a first down conversion receiver function in a manner well-known to one of ordinary skill in the art." (Siwiak, column 3, lines 65-68.), and a person of ordinary skill in the art would know that a local oscillator used in a receiver's front end circuitry is incapable of providing the physical vibrations necessary to induce an alarm from a piezoelectric element coupled to a vibration oscillator, as recited in claim 7. Additionally, Applicant argues that when Weber uses the wording "acoustic coupling," this usage is a misnomer because sound waves are not generated by Weber.

Examiner respectfully disagrees with the above arguments. With regards to claim 6, Siwiak's feeders are not isolated from the ground plane but run coupled to them via their apertures. Further, Siwiak teaches that the feeder may be other "conductive materials" than those listed. Piezoelectric and piezoceramic materials are conductive and are known in the art to be used for actuation. With regards to claim 7, the claim

language only states that the movement of the element generates sound and not that of the oscillator. With regards to the Weber reference, this reference is incorporated to overcome the limitation concerning the positioning of the piezoelectric elements, not the generation of sounds. Therefore, Examiner maintains previous rejections concerning these claims.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. **Claims 1 and 10** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Pankinaho (U.S. Patent # 6,140,966)** in view of **Khorrami et al. (U.S. Patent # 5,970,393)**.

Consider **claim 1**, Pankinaho clearly shows and discloses a planar antenna, the radiating antenna element of which includes at least two lips, thus providing the antenna structure with two separate resonance frequencies. The antenna system is adapted for carrying out internal multifrequency antenna systems for small mobile stations. The antenna may be attached to the back part of a two piece case of a mobile station (it is inherent that this mobile station includes the basic interior circuitry known in the art, reading on the claimed "audio amplifier"), reading on the claimed "integrated radio telephone structure, which radio telephone comprises an audio amplifier; and at least one planar

element for both a first and a second function, said planar element belonging to a radiating plane an antenna in the radio telephone, and the radiating plane of said antenna comprising a first branch and a second branch to produce two different frequency bands," (fig. 6, col. 2 lines 12-15, col. 6 lines 32-35, col. 7 lines 26-29).

However, Pankinaho fails to specifically disclose that there is a piezoelectric element attached to the planar antenna, and that the second function is periodic movement of the planar element.

In the same field of endeavor, Khorrami et al. clearly show and disclose a sensing and actuating, reading on the claimed "second function," antenna. This structure includes a microstrip antenna, an antenna substrate, a piezoelectric layer and a back ground plane (col. 8 lines 45-51). A radio signal is received by the sensing antenna at the other end, producing a received (microwave) voltage, v_c, across the output terminals of the sensing antenna. A sensing voltage, v_s, is generated across the piezoelectric substrate due to a response of the structure (e.g., mechanical vibration of the structure) on which the sensing antenna is mounted. A microstrip actuating antenna **506** is used in a wireless communication system **501** for actuation of a structure. A control signal from the control signal source is modulated by a radio-frequency signal from the microwave signal source by the modulator so as to form an activation signal, which is transmitted by the transmitter antenna. The signal received by the actuation antenna is converted to activation power signal using the non-linear element. The non-linear function of the element can be implemented using an

electronic diode or by the microwave non-linearity of a substrate used with the antenna. The substrate for the antenna may be piezoceramic. The control signal, v_a, is modulated with a microwave carrier signal, v_c, of frequency, f_c, tuned to the resonant frequency of the actuator antenna. The received signal at the actuator antenna is demodulated by a non-linear element. A microwave diode may be used for such non-linear function, which alternatively may be performed by the microwave non-linearity of the piezoelectric substrate. The demodulated actuation signal, v_a, can then be fed back with some voltage shifting electronics (low power circuits) to the antenna input for actuation of the piezoelectric layer, reading on the claimed "the second function being periodic movement of the planar element, for which the structure comprises a piezoelectric element attached to said planar element, wherein periodic movement occurs in a substantial portion of the planar element beyond the location of the piezoelectric element," (fig. 10, col. 7 lines 14-44, col. 8 lines 10-44).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have an actuating antenna that is activated by a voltage through a piezoelectric substrate as taught by Khorrami et al., in the antenna system of Pankinaho, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7).

Consider **claim 10**, Pankinaho, as modified by Khorrami et al., clearly shows and discloses the claimed invention **as applied to claim 1 above**, and in addition, Khorrami et al. further disclose that the smart material may be

piezoelectric ceramic, reading on the claimed “piezoelectric element is made of a ceramic material,” (col. 7 lines 45-50).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have an actuating antenna that is activated by a voltage through a piezoelectric substrate as taught by Khorrami et al., in the antenna system of Pankinaho, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7).

4. **Claims 2 and 3** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Pankinaho (U.S. Patent # 6,140,966)** in view of **Khorrami et al. (U.S. Patent # 5,970,393)**, and in further view of **Mähringer (U.S. Patent # 6,927,732 B2)**.

Consider **claim 2**, and **as applied to claim 1 above**, Pankinaho, as modified by Khorrami et al., clearly shows and discloses the claimed invention, except that the actuation of the antenna generates sound.

In the same field of endeavor, Mähringer clearly shows and discloses a communication terminal provided with an electromagnetic transmission or receiving antenna, an acoustic converter, preferably housed in a mobile telephone, reading on the claimed “integrated radio telephone.” A shaped membrane is incorporated in the surface of a planar antenna to generate sound. The membrane could be configured as a thinner section of material in the antenna surface, connected continuously or only partially to the antenna surface. The membrane contains a piezo-ceramic layer. Piezo-electrical materials are

characterized by a significant interaction between their electrical and mechanical characteristics, and by applying an electrical field mechanical deformations are produced. If an electrical voltage is applied to this electric connection on the piezo-ceramic layer, the piezo-ceramic layer deforms and the membrane is tensioned downwards mechanically. Acoustic sound is generated by the transitioned from the rest position of the tensioned position, reading on the claimed "piezoelectric element is coupled to an audio amplifier output, whereby said periodic movement of the planar element causes generation of sound," (abstract, column 2 lines 53-60 and column 3 lines 4-10, col. 4 lines 7-11).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a piezo-ceramic layer to create acoustic sound as taught by Mähringer, in the antenna system of Pankinaho, as modified by Khorrami et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

Consider **claim 3**, the combination of Pankinaho and Khorrami et al., as modified by Mähringer, clearly shows and discloses the claimed invention **as applied to claim 2 above**, and in addition, Pankinaho further discloses a radiating element **100** of the antenna, reading on the claimed "said planar element is the first branch of the radiating plane," (fig. 1, col. 3 line 24-25).

5. **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Pankinaho (U.S. Patent # 6,140,966)** and **Khorrami et al. (U.S. Patent # 5,970,393)** in view of **Mähringer (U.S. Patent # 6,927,732 B2)**, and in further view of **Weber (U.S. Patent # 5,361,077)**.

Consider **claim 4**, and **as applied to claim 3 above**, the combination of Pankinaho and Khorrami et al., as modified by Mähringer, clearly shows and discloses the claimed invention except that there is a second piezoelectric or piezoceramic element on the antenna.

In the same field of endeavor, Weber clearly shows and discloses an overmoded acoustically coupled antenna, wherein it is desirable to provide an acoustically coupled antenna having a substantially planar structure. The antenna includes a first thin film resonator having a first pair of electrodes and a first thin film piezoelectric element, and a second thin film resonator includes a second pair of electrodes and a second thin film piezoelectric element. The two thin film piezoelectric resonators are electrically isolated but acoustically coupled so that the energy, which is passed between the electrical elements, coupled to one resonator and the electromagnetic radiating elements coupled to the other resonator are interfaced only by way of the acoustical coupling. Acoustical coupling is accomplished by imposing an intervening substrate layer, reading on the claimed "a second piezoelectric element which is attached to the second branch of the radiating plane," (fig. 1, col. 2 lines 16-19, 30-45, col. 6 lines 60-67).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have two piezoelectric elements on an antenna as taught by Weber, in the antenna system of Pankinaho and Khorrami et al., as modified by Mähringer, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

6. **Claims 5-7** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Pankinaho (U.S. Patent # 6,140,966)** in view of **Khorrami et al. (U.S. Patent # 5,970,393)**, and in further view of **Siwiak et al. (U.S. Patent # 5,410,749)**.

Consider **claim 5**, Pankinaho, as modified by Khorrami et al., clearly shows and discloses the claimed invention **as applied to claim 1 above**, and in addition, Pankinaho further discloses that the radiating antenna element is connected to the ground plane **140** at least at one point, reading on the claimed "antenna comprises a separate ground plane," (fig. 2, col. 2 lines 40-41).

However, Pankinaho, as modified by Khorrami et al., fails to specifically disclose that piezoelectric material is on the ground plane.

In the same field of endeavor, Siwiak et al. clearly show and disclose a radio communication device having a microstrip antenna comprising a planar antenna element having first and second major surfaces, a ground plane coupled to the planar antenna element, (figure 2 and column 1 lines 55-59), and first and second feeders, which may be conductive materials, that extend from the second

surface of the planar antenna element and in the ground plane, reading on the claimed "a second piezoelectric element attached to the ground plane" (figure 2, col. 1 lines 55-59, col. 3 lines 55-58).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to attach feeders, made of conductive materials, reading on the claimed "piezoelectric material," to a ground plane as taught by Siwiak et al. in the antenna system of Pankinaho, as modified by Khorrami et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

Consider **claim 6**, the combination of Pankinaho and Khorrami et al., as modified by Siwiak et al., clearly shows and discloses the claimed invention **as applied to claim 5 above**, and in addition, Siwiak et al. further disclose a radio communication device having a microstrip antenna comprising a planar antenna element having first and second major surfaces, a ground plane coupled to the planar antenna element, (figure 2 and column 1 lines 55-59), and first and second feeders, which may be conductive materials, that extend from the second surface of the planar antenna element and in the ground plane, reading on the claimed "piezoelectric element is attached to the ground plane at a first fixedly-supported end thereof, and the second piezoelectric element which is attached to the ground plane at a second fixedly-supported end thereof" (figure 2, col. 1 lines 55-59, col. 3 lines 55-58).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to attach feeders, made of conductive materials, reading on the claimed "piezoelectric material," to a ground plane as taught by Siwiak et al. in the antenna system of Pankinaho, as modified by Khorrami et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

Consider **claim 7**, and **as applied to claim 1 above**, Pankinaho, as modified by Khorrami et al., clearly shows and discloses the claimed invention except that the mobile station comprises a vibration oscillator and that a piezoelectric element is coupled to the oscillator and generates alarm vibration.

In the same field of endeavor, Siwiak et al. clearly show and disclose a radio communication device having a microstrip antenna comprising a planar antenna element having first and second major surfaces, and a ground plane coupled to the planar antenna element. Siwiak et al. further disclose first and second feeders, which may be conductive materials, that extend from the second surface of the planar antenna element and in the ground plane. The first and second feeders are present to electrically couple signals intercepted by the planar antenna element with primary receiver element circuits which comprise a conventional RF amplifier, a local oscillator, a mixer, and associated filters, reading on the claimed "radio telephone comprises a vibration oscillator, a piezoelectric element being coupled to the vibration oscillator, whereby said

periodic moving of the planar element is generation of alarm vibration" (figure 2, figure 5, column 1 lines 55-59, column 3 lines 55-58 and column 3 lines 60-65).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to attach an oscillator as taught by Siwiak et al. in the antenna system of Pankinaho, as modified by Khorrami et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

7. **Claim 9** is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Pankinaho (U.S. Patent # 6,140,966)** and **Khorrami et al. (U.S. Patent # 5,970,393)** in view of **Mähringer (U.S. Patent # 6,927,732 B2),** and in further view of **Suzuki (JP 06224824 A)**.

Consider **claim 9**, and **as applied to claim 1 above,** Pankinaho, as modified by Khorrami et al., clearly shows and discloses the claimed invention except that periodic movement of the planar element is caused by sound waves.

In the same field of endeavor, Mähringer clearly show and disclose a communication terminal provided with an electromagnetic transmission or receiving antenna, an acoustic converter, preferably housed in a mobile telephone. Piezo-electrical materials are characterized by a significant interaction between their electrical and mechanical characteristics, and by applying an electrical field mechanical deformations are produced. Mechanical pressure on these materials, however, generates electrical charges. This

structure therefore allows sound signals to be picked up, reading on the claimed "periodic movement of the planar element is caused by sound waves, and said piezoelectric element generates an electric signal corresponding to the sound waves" (abstract, column 2 lines 53-54, 59-60 and column 3 lines 4-10).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to allow the piezoelectric element to generate electrical charge as taught by Mähringer, in the antenna system of Pankinaho, as modified by Khorrami et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

However, the combination of Pankinaho and Khorrami et al., as modified by Mähringer, fails to specifically disclose that sound waves cause the periodic movement.

In the same field of endeavor, Suzuki clearly shows and discloses a wireless call deliver volume receiver which improves the structure of the sounding body, reading on the claimed "integrated radio telephone structure," (paragraph 1). In the card type wireless call delivery volume receiver that has the cross-section horseshoe-shaped receiving antenna, which made the receiving machine box object serve a double purpose, one side of the receiving antenna of the wireless call delivery volume receiver is monotonous with a plate like piezoelectric transducer thin to the inside of a conductor, (paragraph 5). The receiver circuit emits an acoustic wave, reading on the claimed "sound waves

coming from outside the planar element," when the receiving antenna receives a wireless call signal (paragraph 8).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the receiver circuit emit waves in response to an outside signal as taught by Suzuki in the antenna system of Pankinaho and Khorrami et al., as modified by Mähringer, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

8. **Claim 11** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Pankinaho (U.S. Patent # 6,140,966)** in view of **Mähringer (U.S. Patent # 6,927,732 B2)**.

Consider **claim 11**, Pankinaho clearly shows and discloses a planar antenna, the radiating antenna element of which includes at least two lips, thus providing the antenna structure with two separate resonance frequencies. The antenna system is adapted for carrying out internal multifrequency antenna systems for small mobile stations. The antenna may be attached to the back part of a two piece case of a mobile station (it is inherent that this mobile station includes the basic interior circuitry known in the art, reading on the claimed "audio amplifier"), reading on the claimed "integrated radio telephone structure comprising at least one planar antenna, having a radiating plane and a planar element, configured to perform radio-frequency; a radiating plane of said antenna

comprising a first branch and a second branch to produce two different frequency bands," (fig. 6, col. 2 lines 12-15, col. 6 lines 32-35, col. 7 lines 26-29).

However, Pankinaho fails to specifically disclose that there is a piezoelectric element attached to the planar antenna.

In the same field of endeavor, Mähringer clearly shows and discloses a communication terminal provided with an electromagnetic transmission or receiving antenna, an acoustic converter, preferably housed in a mobile telephone, reading on the claimed "integrated radio telephone." A shaped membrane is incorporated in the surface of a planar antenna to generate sound. The membrane could be configured as a thinner section of material in the antenna surface, connected continuously or only partially to the antenna surface. The membrane contains a piezo-ceramic layer. Piezo-electrical materials are characterized by a significant interaction between their electrical and mechanical characteristics, and by applying an electrical field mechanical deformations are produced. Mechanical pressure on these materials, however, generates electrical charges. This structure therefore allows sound signals to be picked up, reading on the claimed "at least one planar antenna configured to perform radio-frequency and audio-frequency operations, wherein the audio-frequency operations are periodic movement of said planar element; at least one piezoelectric element attached to the planar element, wherein the piezoelectric element induces a periodic movement of a substantial portion of the planar element" (abstract, column 2 lines 53-60 and column 3 lines 4-10).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to allow the piezoelectric element to generate electrical charge on a planar antenna as taught by Mähringer, in the antenna system of Pankinaho, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7).

9. **Claim 12** is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Pankinaho (U.S. Patent # 6,140,966)** and **Khorrami et al. (U.S. Patent # 5,970,393)** in view of **Weber (U.S. Patent # 5,361,077)**, and in further view of **Siwiak et al. (U.S. Patent # 5,410,749)**.

Consider **claim 12**, Pankinaho clearly shows and discloses a planar antenna, the radiating antenna element of which includes at least two lips, thus providing the antenna structure with two separate resonance frequencies. The antenna system is adapted for carrying out internal multifrequency antenna systems for small mobile stations. The antenna may be attached to the back part of a two piece case of a mobile station (it is inherent that this mobile station includes the basic interior circuitry known in the art, reading on the claimed "audio amplifier"), reading on the claimed "integrated radio telephone structure, which radio telephone comprises an audio amplifier; and at least one planar element for both a first, said planar element belonging to an antenna in the radio telephone, and a radiating plane of said antenna comprising a first branch and a

second branch to produce two different frequency bands," (fig. 6, col. 2 lines 12-15, col. 6 lines 32-35, col. 7 lines 26-29).

However, Pankinaho fails to specifically disclose that there is a piezoelectric element attached to the planar antenna, and that a second function is the movement of the planar element.

In the same field of endeavor, Khorrami et al. clearly show and disclose a sensing and actuating, reading on the claimed "second function," antenna. This structure includes a microstrip antenna, an antenna substrate, a piezoelectric layer and a back ground plane (col. 8 lines 45-51). A radio signal is received by the sensing antenna at the other end, producing a received (microwave) voltage, v_c, across the output terminals of the sensing antenna. A sensing voltage, v_s, is generated across the piezoelectric substrate due to a response of the structure (e.g., mechanical vibration of the structure) on which the sensing antenna is mounted. A microstrip actuating antenna **506** is used in a wireless communication system **501** for actuation of a structure. A control signal from the control signal source is modulated by a radio-frequency signal from the microwave signal source by the modulator so as to form an activation signal, which is transmitted by the transmitter antenna. The signal received by the actuation antenna is converted to activation power signal using the non-linear element. The non-linear function of the element can be implemented using an electronic diode or by the microwave non-linearity of a substrate used with the antenna. The substrate for the antenna may be piezoceramic. The control

signal, v_a, is modulated with a microwave carrier signal, v_c, of frequency, f_c, tuned to the resonant frequency of the actuator antenna. The received signal at the actuator antenna is demodulated by a non-linear element. A microwave diode may be used for such non-linear function, which alternatively may be performed by the microwave non-linearity of the piezoelectric substrate. The demodulated actuation signal, v_a, can then be fed back with some voltage shifting electronics (low power circuits) to the antenna input for actuation of the piezoelectric layer, reading on the claimed "at least one planar element for both a first and a second function, and the second function being periodic movement of said planar element," (fig. 10, col. 7 lines 14-44, col. 8 lines 10-44).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have an actuating antenna that is activated by a voltage through a piezoelectric substrate as taught by Khorrami et al., in the antenna system of Pankinaho, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7).

However, Pankinaho, as modified by Khorrami et al., fails to specifically disclose that there is a piezoelectric element attached to the planar antenna.

In the same field of endeavor, Weber clearly shows and discloses an overmoded acoustically coupled antenna, wherein it is desirable to provide an acoustically coupled antenna having a substantially planar structure. The antenna includes a first thin film resonator having a first pair of electrodes and a first thin film piezoelectric element, and a second thin film resonator includes a

second pair of electrodes and a second thin film piezoelectric element. The two thin film piezoelectric resonators are electrically isolated but acoustically coupled so that the energy, which is passed between the electrical elements, coupled to one resonator and the electromagnetic radiating elements coupled to the other resonator are interfaced only by way of the acoustical coupling. Acoustical coupling is accomplished by imposing an intervening substrate layer, reading on the claimed "a first and second piezoelectric element, first piezoelectric element being attached to the first branch of the radiating plane and the second piezoelectric element being coupled to the second branch of the radiating plane," (fig. 1, col. 2 lines 16-19, 30-45, col. 6 lines 60-67).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have two piezoelectric elements on an antenna as taught by Weber, in the antenna system of Pankinaho, as modified by Khorrami et al., in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

However, the combination of Pankinaho and Khorrami et al., as modified by Weber, fails to specifically disclose that there is a piezoelectric element attached to an oscillator.

In the same field of endeavor, Siwiak et al. clearly show and disclose a radio communication device having a microstrip antenna comprising a planar antenna element having first and second major surfaces, and a ground plane coupled to the planar antenna element. Siwiak et al. further disclose first and

second feeders, which may be conductive materials, that extend from the second surface of the planar antenna element and in the ground plane. The first and second feeders are present to electrically couple signals intercepted by the planar antenna element with primary receiver element circuits which comprise a conventional RF amplifier, a local oscillator, a mixer, and associated filters, reading on the claimed "second piezoelectric element being coupled to the vibration oscillator" (figure 2, figure 5, column 1 lines 55-59, column 3 lines 55-58 and column 3 lines 60-65).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to attach an oscillator as taught by Siwiak et al. to the antenna of Pankinaho and Khorrami et al., as modified by Weber, in order to have a small-sized antenna operate on several frequency bands (Pankinaho; col. 1 lines 5-7), applicable in mobile stations.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jaime M. Holliday whose telephone number is (571) 272-8618. The examiner can normally be reached on Monday through Friday 7:30am to 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Feild can be reached on (571) 272-4090. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JOSEPH FEILD
SUPERVISORY PATENT EXAMINER

Jaime Holliday

Patent Examiner